Martin Radnor Road Project Specifications for Construction of Roads

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(April 8, 2016)

Section 101—Abbreviations, Acronyms, & Terms

101.01 Terms, Organizations, & Standards

These specifications are generally written in the imperative mood. In sentences using the imperative mood, the subject, "the Contractor," is implied. Also implied in this language is "shall," "shall be," or similar words and phrases. In material specifications, the subject may also be the supplier, fabricator, or manufacturer supplying material, products, or equipment for use on the project.

Wherever "directed," "required," "prescribed," or similar words are used, the "direction," "requirement," or "order" of the Contracting Officer (CO) is intended. Similarly, wherever "approved," "acceptable," "suitable," "satisfactory," or similar words are used, they mean "approved by," "acceptable to," or "satisfactory to" the CO.

The word "will" generally pertains to decisions or actions of the CO.

Whenever in these specifications, or in other contract documents, the following terms (or pronouns in place of them) are used, the intent and meaning shall be interpreted as follows: reference to a specific standard, test, testing method, or specification shall mean the latest published edition or amendment that is in effect at the solicitation issue date for Public Works Contracts or the sale advertisement date for Timber Sale Contracts.

These specifications are divided into the following divisions:

- Division 100 consists of general specifications for which no direct payment is made. These requirements are applicable to all contracts.
- Division 150 consists of engineering requirements that are applicable to some contracts. Work under this division is paid for directly when there is a PAY ITEM IN THE SCHEDULE OF ITEMS. When there is no PAY ITEM IN THE SCHEDULE OF ITEMS, no direct payment is made.
- Divisions 200–600 consist of construction contract requirements for specific items of work. Work under these divisions is paid for directly or indirectly according to Section 106 and the section for ordering the work when there is a PAY ITEM IN THE SCHEDULE OF ITEMS.
- Division 700 contains the material requirements for Divisions 200–600. No direct payment is made under Division 700. Payment for material is included as part of the work required in Divisions 200–600.

(a) Acronyms. The following acronyms are used in these specifications:

AA	Aluminum Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ADA	Americans With Disabilities Act
AGC	Associated General Contractors of America
AI	Asphalt Institute
AISC	American Institute of Steel Construction
AITC	American Institute of Timber Construction
ALSC	American Lumber Standards Committee
ANSI	American National Standards Institute
APA	American Plywood Association
ARTBA	American Road and Transportation Builders Association

ASTM	American Society for Testing and Material
AWPA	American Wood Preservers Association
AWS	American Welding Society
AWWA	American Water Works Association
CFR	Code of Federal Regulations
CRSI	Concrete Reinforcing Steel Institute
DEMA	Diesel Engine Manufacturers Association
DOT	U.S. Department of Transportation
FAR	Federal Acquisition Regulation
FHWA	Federal Highway Administration
FLH	Federal Lands Highway (Federal Highway Administration)
FSS	Federal Specifications and Standards
ISSA	International Slurry Surfacing Association
MIL	Military Specification(s)
MSHA	Mine Safety and Health Administration
MUTCD	Manual on Uniform Traffic Control Devices
NBS	National Bureau of Standards
OSHA	Occupational Safety and Health Administration
PCI	Prestressed Concrete Institute
PTI	Post-Tensioning Institute
SI	International System of Units
SSPC	Steel Structures Painting Council
WWPI	Western Wood Preservation Institute

(b) System of International Units (SI) Symbols.

(c) SI Prefix Symbols.

(d) Slope Notation (horizontal : vertical). Express the slope as the ratio of a number of units horizontal to one unit vertical.

101.02 Abbreviations & Symbols

ABS	Acrylonitrile-butadiene-styrene
ACA	Ammoniacal copper arsenate
ACZA	Ammoniacal copper zinc arsenate
Agg	Aggregate
Al	Aluminum
AOS	Apparent opening size
AQ	Actual quantities
AQL	Acceptable Quality Level
BMP	Best Management Practice
CAPWAP	Case pile wave analysis program
CCA	Chromated copper arsenate
CMP	Corrugated metal pipe
CMPA	Corrugated metal pipe arch
CO	Contracting Officer

CPF	Composite pay factor
CSP	Corrugated steel pipe
CSPA	Corrugated steel pipe arch
CTB	Cement-treated base
CY	Cubic Yard
CY MI	Cubic Yard Mile
DAR	Durability Absorption Ratio
Dia	Diameter
DQ	Designed quantities
DTI	Direct tension indicator
Dwgs	Drawings
EA	Each
FM	Fineness modulus
Ft	Foot
GAL	Gallon
GFM	Government-furnished materials
Gr	Grade
Ht	Height
ha	Hectare
HDO	High-density overlay
HDPE	High-density polyethylene
hr	Hour
Hor	Horizontal
HSLA	High-strength low-alloy
In	Inch
kg	Kilogram
kL	Kiloliter
kL km	Kiloliter kilometer
km	Kilometer
L	Length
l	Liter
Lbs	pounds
LF	Linear Foot
LS	Lump Sum
LSL	Lower specification limit
m	Meter
m2	Square meter
m3	Cubic meter
m3 km	Cubic meter kilometer
Matl	Material
max.	Maximum
Mbf	Thousand board feet

Mi	Mile
MFBM	One thousand feet board measure
M Gals	One thousand gallons
M Gals Mi	One thousand gallons mile
min.	Minimum
Misc	Miscellaneous
mm	Millimeter
MSF	One thousand square feet
N/C	Numerically controlled
PG	Performance-graded
PI	Plasticity index
ppm	Parts per million
PS	Product Standard (issued by the U.S. Department of Commerce)
PVC	Polyvinylchloride
Sec	Section
SF	Square Feet
SQ	Staked quantities
STA	Station
STA YD	Station Yard
SY	Square Yard
t	Ton (1,000 kg)
t km	Ton kilometer
T	Temperature
T&L	Tops and limbs
TFE	Tetraflouroethylene
Th	Thickness
TM	Ton mile
TV	Target value
USL	Upper specification limit
Vert	Vertical
VMA	Voids in Mineral Aggregate
VOC	Volatile organic compound
Yd	Yard
W	Width
W/	With
W/O	Without
WW	Woven wire
WWF	Welded wire fabric
"	Inches
'	Feet

Section 102—Definitions

Wherever the following terms, or pronouns in place of them, are used in these specifications or in other contract documents, the intent and meaning are as follows:

Adjustment in Contract Price. "Equitable adjustment," as used in the Federal Acquisition Regulations, or "construction cost adjustment," as used in the Timber Sale Contract, as applicable.

Arch. A culvert section, usually formed of bolted structural plates, that is an arc of a circle (usually one-half or less); that is, a bottomless culvert.

Base Course. The layer or layers of specified or selected material of designed thickness placed on a subbase or subgrade to support a surface course. (See figure 102-1.)

Bearings. The portion of a beam, girder, or truss that transmits the bridge superstructure load to the substructure.

Berm. Curb or dike constructed to control roadway runoff water. (See figure 102-1.)

Best Management Practice. A series of water quality protection practices and procedures approved or certified by the State water quality agency under the provisions of sections 319 and 402 of the Clean Water Act, as amended.

Bridge. A structure, including supports, erected over a depression or an obstruction, such as water, a road, a trail, or a railway, and having a floor for carrying traffic or other moving loads.

Bridge Length. The overall length measured along the centerline of road to the back of abutment backwalls, if present; otherwise, end to end of the bridge floor, but in no case less than the total clear opening of the structure.

Bridge Traveled Way Width. The clear width measured at right angles to the longitudinal centerline of the bridge between the bottom of curbs or, if curbs are not used, between the inner faces of parapet or railing.

Certificate of Compliance. A signed statement by a person with legal authority to bind a company or supplier to its product. The certificate states that the material or assemblies furnished fully comply with the requirements of the contract.

Change. "Change" means "change order" as used in the Federal Acquisition Regulations, or "design change" as used in the Timber Sale Contract.

Clearing Limits. The limits of clearing as designated on the ground or on the drawings. (See figure 102-1.)

Cofferdam. A cofferdam is an enclosed single or double wall braced structure with walls sheeted with timber, concrete, or steel, and extending well below the bottom of excavation, when practical. Earthen or rockfill dikes, dams, or embankments are not considered cribs or cofferdams for this purpose.

Conduit. A natural or artificial channel for carrying fluids, such as water pipe, canal, or aqueduct.

Construction Slash. All vegetative material not meeting Utilization Standards, such as tops and limbs, timber, brush, and grubbed stumps associated with construction or reconstruction of a facility.

Contracting Officer (CO). The person with the authority to enter into, administer, and/or terminate contracts and make related determinations and findings. The term includes certain authorized representatives of the CO acting within the limits of their authority as delegated by the CO. Authorized representatives include the Forest Service Representative, Engineering Representative, Contracting Officer's Representative, and Inspector.

Contractor. The individual, partnership, joint venture, or corporation undertaking the execution of the work under the terms of the contract and acting directly or through agents, employees, or subcontractors. As used in specifications and drawings for specified roads (Timber Sale Contracts), "Contractor" is "purchaser."

Controlled Felling. Directing the placement of trees in felling by using wedges, jacks, cable tension, or distribution of holding wood, or any combinations of these, to ensure that trees are dropped into previously cleared areas, or clear of any objects that are to remain.

Culvert. A conduit or passageway under a road, trail, or other obstruction. A culvert differs from a bridge in that it is usually constructed entirely below the elevation of the traveled way.

Curve Widening. Additional width added to curves to allow for vehicle offtracking.

Cushion Material. Native or imported material generally placed over rocky sections of unsurfaced roads to provide a usable and maintainable traveled way.

Defect. A failure to meet a requirement with respect to a single quality characteristic.

Drawings. The documents, including plan and profile sheets, plans, cross sections, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials showing details for construction of a facility.

Embankment. A structure of soil, aggregate, or rock material placed on the prepared ground surface and constructed to subgrade.

Equipment. All machinery and equipment, together with the necessary supplies for upkeep and maintenance, as well as tools and apparatus necessary for the proper construction and acceptable completion of the work.

Excess Excavation. Material from the roadway in excess of that needed for construction of designed roadways.

Falsework. Any temporary construction work used to support the permanent structure until it becomes self-supporting. Falsework includes steel or timber beams, girders, columns, piles, foundations, and any proprietary equipment including modular shoring frames, post shores, and adjustable horizontal shoring.

Forest Service. The United States of America, acting through the Forest Service, U.S. Department of Agriculture.

Government Land. National Forest System lands, and other lands controlled or administered by the Forest Service or other Federal agencies.

Inspector. The Government-authorized representative designated in writing by the Contracting Officer, Contracting Officer's Representative, or Engineering Representative responsible for detailed inspection.

Invert. The lowest point of the internal cross section of culvert or pipe arch.

Job-Mix Formula. The percentage of each material in a mixture intended for a particular use.

Laboratory. A testing laboratory of the Government, or any other testing laboratory approved by the Contracting Officer.

Live Stream. A defined streambed with flowing water.

Lot. An isolated quantity of material from a single source; a measured amount of construction assumed to be produced by the same process.

Materials. Any substance specified for use in the construction of the project and its appurtenances.

Maximum Density. The highest density that can be obtained for a specific material using the stated test procedure.

Measurement. Determining and expressing the quantities of work or materials.

Multibeam Girder. A precast, prestressed concrete member where the concrete deck is precast as an integral part of the member.

Neat Line. A line defining the proposed or specified limits of an excavation or structure.

Nominal Dimensions or Weights. The numerical values shown on the drawings or in the specifications as measurements of material to be used in the construction.

Nominal Maximum Particle Size. The largest sieve size listed in the applicable specification upon which any material is permitted to be retained.

Overbreak. Material beyond the neat line of an excavation that is removed in the process of excavation, usually by blasting.

Pass. A pass shall consist of one complete coverage of the surface.

Pavement Structure. Subbase, base, or surface course, or combination thereof, placed on a subgrade to support the traffic load and distribute it to the roadbed.

Pioneer Road. Temporary construction access built along the route of the project.

Pipe. A culvert that is circular (round) in cross section.

Pipe Arch. A pipe that has been factory-deformed from a circular shape such that the width (or span) is larger than the vertical dimension (or rise).

Profile Grade. The trace of a vertical plane, as shown on the drawings, intersecting the top surface at the centerline of the proposed facility construction.

Project Specifications. The specifications that detail the conditions and requirements specific to the individual project, including additions and revisions to Standard Specifications.

Purchaser. The individual, partnership, joint venture, or corporation contracting with the Government under the terms of a Timber Sale Contract and acting independently or through agents, employees, or subcontractors.

Random Sampling. A sample of material chosen such that each increment of a population of material has an equal probability of being selected.

Reasonably Close Conformity. Compliance with reasonable and customary manufacturing and construction tolerances, performing all work and furnishing all materials in “reasonably close conformity” with lines, grades, cross sections, dimensions, and material requirements shown on the drawings, indicated in the specifications, or designated on the ground.

Right-of-Way. A general term denoting (1) the privilege to pass over land in some particular line (including easement, lease, permit, or license to occupy, use, or traverse public or private lands), or (2)

land, appurtenances thereto, or interest therein, usually in a strip, acquired for public or private passageway. (See figure 102-1.)

Road Order. An order affecting and controlling traffic on roads under Forest Service jurisdiction. Road Orders are issued by a designated Forest Officer under the authorities of 36 CFR, part 260.

Road Template. The shape and cross-sectional dimensions of the roadway to be constructed, as defined by the construction staking notes and the characteristics of the typical sections.

Roadbed. The graded portion of a road between the intersection of subgrade and side slopes, excluding that portion of the ditch below subgrade. (See figure 102-1.)

Roadside. A general term denoting the area adjoining the outer edge of the roadway. (See figure 102-1.)

Roadway. The portion of the road within the limits of excavation and embankment, including slope rounding. (See figure 102-1.)

Schedule of Items. A schedule in the contract that contains a listing and description of construction items, quantities, units of measure, methods of measurement, unit price, and amount.

Second Samples. A sample taken when the initial sample indicates that the material is defective.

Shoulder. The portion of the roadway contiguous to the traveled way for accommodation of stopped vehicles, emergency use, and lateral support of pavement structure. (See figure 102-1.)

Sidewalk. The portion of the roadway constructed primarily for pedestrian use.

Specifications. A description of the technical requirements for a material, product, or service that includes criteria for determining whether these requirements are met.

Spring Line. The point of contact between arch and footing.

Standard Specifications. Specifications approved for general application and repetitive use.

Station. (1) A measure of distance used for highways and railroads equal to 1 feet. (2) A precise location along a survey line.

Subbase. The layers of specified or selected material of designed thickness placed on a subgrade to support a base course.

Subgrade Treatment. Modification of roadbed material by stabilization.

Subgrade. The prepared surface, including widening for curves, turnouts, and other areas upon which a subbase, base, or surface course is constructed. For roads without base course or surface course, that portion of roadbed prepared as the finished wearing surface. (See figure 102-1.)

Substructure (Bridge). All of that part of the structure below the bearings of simple and continuous spans, skewbacks of arches, and tops of footings of rigid frames, together with the backwalls, wingwalls, and wing protection railings.

Superstructure (Bridge). The entire structure, except the substructure.

Surface Course. The top layer of a pavement structure, sometimes called the wearing course, usually designed to resist skidding, traffic abrasion, and the disintegrating effects of climate. (See figure 102-1.)

Tackifier. Binder for vegetative mulch.

Target Value. Values that are established according to contract, and from which allowable variations are measured.

Timber Sale Contract. A written contract for the removal of national forest timber.

Tops and Limbs. All woody material including bushes, vines, and portions of trees smaller than the dimensions for timber shown in Subsection 201.03.

Traveled Way. The portion of the roadway for the movement of vehicles, exclusive of shoulders and auxiliary lanes. (See figure 102-1.)

Turnout. A short auxiliary lane on a one-lane road provided for the passage of meeting vehicles.

Unit of Measurement. The unit and fractions of units DESIGNATED IN THE SCHEDULE OF ITEMS.

Unsuitable Material. The material excavated during roadway construction that is not usable in embankment and must be disposed of, or that can be used only in certain locations or for limited purposes.

Utilization Standards. The minimum size and percent soundness of trees described in the specifications to determine merchantable timber.

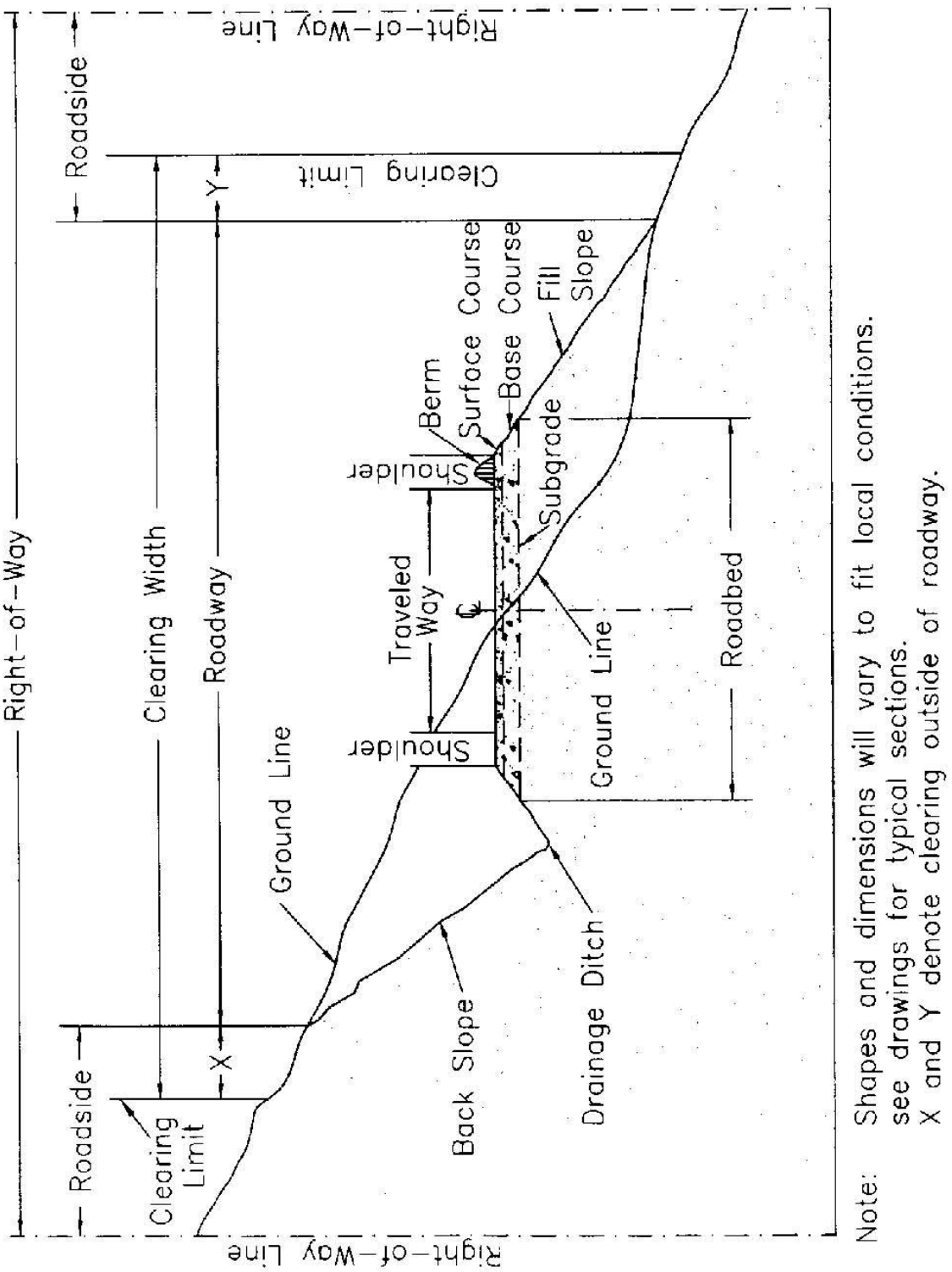

Figure 102-1.—Illustration of road structure terms.

Section 103—Intent of Contract

The intent of the contract is to provide for the complete construction of the project described in the contract. Unless otherwise provided, furnish all labor, materials, equipment, tools, transportation, and supplies, and perform all work required to complete the project in reasonably close conformity with drawings and specifications, and in accordance with provisions of the contract.

Section 104—Maintenance for Traffic

104.01 Roads To Be Constructed

Unless otherwise SHOWN ON THE DRAWINGS or described in the PROJECT SPECIFICATIONS, keep existing roads open to all traffic during road improvement work, and maintain them in a condition that will adequately accommodate traffic. Perform no work that interferes or conflicts with traffic or existing access to the roadway surface until a plan for the satisfactory handling of traffic has been approved. Specific requirements for temporary closures, detours, part-width construction, and access to adjacent or intersecting facilities will be SHOWN ON THE DRAWINGS or described in the PROJECT SPECIFICATIONS. Post construction signs and traffic control devices in conformance with the "Manual on Uniform Traffic Control Devices" (MUTCD). Do not proceed with work on the project until all required signs are in place and approved.

Before shutting down any operations, take all necessary precautions to prevent damage to the project, such as temporary detours, approaches, crossings, or intersections; and provide for normal drainage and minimization of erosion. Leave all travelways in a condition suitable for traffic.

The Government may permit use of portions of the project during periods when operations have shut down All maintenance attributable to permitted use during periods of work suspension will be provided by the Government, except for maintenance needed through the fault or negligence of the Contractor. The Contractor shall be responsible for any maintenance not attributable to use, or that is necessary during suspensions through the fault or negligence of the Contractor.

When SHOWN ON THE DRAWINGS or described in the PROJECT SPECIFICATIONS, road segments may be closed to all traffic during the period(s) when construction is in progress. If any of the listed roads are to be closed during construction operations, give at least 14 days advance notice.

Unless otherwise provided, when construction activity is in progress and total closure has not been provided for herein, delays may not exceed *30 minutes*, in order to reasonably accommodate traffic.

104.02 Use of Roads by Contractor

The Contractor is authorized to use roads under the jurisdiction of the Forest Service for all activities necessary to complete this contract, subject to the limitations and authorizations SHOWN ON THE DRAWINGS, designated in the Road Order, or described in the PROJECT SPECIFICATIONS, when such use will not damage the roads or national forest resources, and when traffic can be accommodated safely.

Section 105—Control of Materials

105.01 Handling Materials

Transport and handle all materials to preserve their quality and fitness for the work. Stockpile, load, and transport aggregates in a manner that will preserve specified gradation and avoid contamination. Do not intermingle stockpiles of aggregate with different gradations. Stockpile crushed or screened aggregate in accordance with Section 305.

105.02 Weighing Devices

105.03 Sampling & Testing of Aggregate

105.04 Certification & Sampling of Asphalt Materials

105.05 Rights in & Use of Materials Found or Produced on the Work

(a) With the written approval of the CO, suitable stone, gravel, sand, or other material found in the excavation can be used on the project. Payment will be made both for the excavation of such materials at the corresponding contract unit price and for the pay items for which the excavated material is used. Replace, without additional compensation, sufficient suitable materials to complete the portion of the work that was originally contemplated to be constructed with such material.

(b) Materials produced or processed from Government lands in excess of the quantities required for performance of this contract are the property of the Government. The Government is not obligated to make reimbursement for the cost of producing these materials.

105.06 Material Sources

(a) Designated Sources. Sources of local materials designated in the PROJECT SPECIFICATIONS or SHOWN ON THE DRAWINGS are guaranteed by the Government for the quality and quantity of material in the source. Determine the equipment and work required to produce the specified product. Utilize all suitable material in the source. The designation of a source includes the Contractor's right to use areas SHOWN ON THE DRAWINGS for the purposes designated (that is, plant sites, stockpiles, and haul roads). Unless otherwise indicated or approved, no additional operating area shall be allowed. In this case, operate only in the confines of the area(s) designated.

The weight/volume relationship used for determining designed quantities (DQ) of material in designated sources subject to weight measurement is SHOWN ON THE DRAWINGS.

Should the designated source contain insufficient suitable material due to causes beyond the Contractor's control, the Government will provide another source, with an adjustment in contract price, in accordance with applicable contract provisions.

Designated sources will be available for the Contractor's use during the periods SHOWN ON THE DRAWINGS. Use at any other time will require an agreement with the party scheduled for that period, with the CO's approval.

(b) Contractor-Furnished Sources. When the material sources are not designated as provided above, or when designated sources are not used, furnish material that produces an end product equivalent in performance to that originally designated. An adjustment in contract price shall be made where the weight/ volume relationship differences between designated source material and Contractor-furnished source material result in a financial disadvantage to the Government. When SHOWN ON THE

DRAWINGS, complete any pit development specified for a designated source, even when material is not obtained from the source.

Test for quality in conformance with applicable requirements, to establish the equivalency of the end product. Furnish test results and a Certificate of Compliance.

Section 106—Measurement & Payment

106.01 Measurement & Payment

Compensation provided for in the contract is full payment for performing all contract work in a complete and acceptable manner. All risk, loss, damage, or expense arising out of the nature or prosecution of the work is included in the compensation provided by the contract.

Work required by the contract will not be paid for directly unless a PAY ITEM for the work is DESIGNATED IN THE SCHEDULE OF ITEMS.

Work referenced for measurement under another section will not be paid for directly unless a PAY ITEM for the work is DESIGNATED IN THE SCHEDULE OF ITEMS for the referenced section.

Work not paid for directly is considered to be included under the other contract PAY ITEMS.

Unless otherwise shown, work measured and paid for under one PAY ITEM will not be paid for under any other PAY ITEM.

The quantity to be paid for is the quantity DESIGNATED IN THE SCHEDULE OF ITEMS. No payment will be made for work performed in excess of that staked, ordered, or otherwise authorized.

When more than one class, size, or thickness is specified in the SCHEDULE OF ITEMS for any PAY ITEM, suffixes will be added to the item number to differentiate between the items.

All costs associated with the cleaning of construction equipment shall be considered subsidiary to other items in this contract and the Contractor will not be paid an additional amount for this work.

106.02 Determination of Quantities

The following measurements and calculations are used to determine contract quantities.

For individual construction items, longitudinal and lateral measurements for area computations shall be made horizontally or corrected to horizontal measurement unless otherwise specified. Measurements for seeding, mulching, geotextiles, netting, erosion control blankets, and sodding shall be along slope lines.

The average end area method shall be used to compute volumes of excavation or embankment. However, if in the judgment of the CO the average end area method is impractical, measurement shall be made by volume in hauling vehicles, or by other three-dimensional methods.

Structures shall be measured according to neat lines SHOWN ON THE DRAWINGS, or as altered by the CO in writing to fit field conditions.

For items that have linear measurements, such as pipe culverts, fencing, guardrails, and underdrains, measurements shall be made parallel to the base or foundation upon which the structures are placed. Pipe and pipe arch culverts shall be measured along center of invert, and arches shall be measured at spring line.

For aggregates weighed for payment, the tonnage weight shall not be adjusted for moisture content, unless otherwise provided in PROJECT SPECIFICATIONS.

For standard manufactured items—such as fence, wire, plates, rolled shapes, and pipe conduits—identified by gauge, weight, section dimensions, and so forth, such identifications shall be considered the

nominal weights or dimensions. Unless controlled by tolerances in cited specifications, manufacturer's tolerances shall be accepted.

106.03 Units of Measurement

Payment will be by units defined and determined according to measure. Unless otherwise specified, the meanings of the following terms are as follows:

(a) Cubic Yard in Place (yd^3). Measure solid volumes by the average end area method as follows:

(1) Measure cross sections of the original ground and use with design or staked templates, or take other comparable measurements to determine the end areas. Do not measure work outside of the established lines or slopes.

(2) If any portion of the work is acceptable, but is not completed to the established lines and slopes, re-measure cross sections or comparable measurements of that portion of the work. Deduct any quantity outside the designated or staked limits. Use these measurements to calculate new end areas.

(3) Compute the quantity using the average end areas multiplied by the horizontal distance along a centerline or reference line between the end areas. Deduct any quantity outside the designed or staked limits.

Where it is impractical to measure material by the average end area method, other methods involving three-dimensional measurements may be used.

Measure liquid volumes in accordance with Subsection 106.03(h).

(b) Cubic Yard in the Hauling Vehicle. Measure the cubic yard volume in the hauling vehicle using three-dimensional measurements at the point of delivery. Use vehicles bearing a legible identification mark with the body shaped so the actual contents may be readily and accurately determined. Before use, mutually agree in writing upon the volume of material to be hauled by each vehicle. Vehicles carrying less than the agreed volume may be rejected or accepted at the reduced volume.

Level selected loads. If leveling reveals that the vehicle was hauling less than the approved volume, reduce the quantity of all material received since the last leveled load by the same ratio as the ratio of the current leveled load volume to the agreed volume. Payment will not be made for material in excess of the agreed volume.

Material measured in the hauling vehicle may be weighed and converted to cubic yard s for payment purposes if the conversion factors are mutually agreed to in writing.

Compute measurement using measurements of material in the hauling vehicles at the point of delivery. Load vehicles to at least their water-level capacity. Leveling of the loads may be required when vehicles arrive at the delivery point.

(c) Each. One entire unit, which may consist of one or more parts. The quantity is the actual number of units completed and accepted.

(d) Acre. 43,560 square feet. Make longitudinal and transverse measurements for area computations horizontally. Do not make deductions from the area computation for individual exclusions having an area of 50 square yards or less.

(e) Hour. Measurement will be for the actual number of hours ordered and performed by the Contractor.

(f) Pound. 7,000 grains divided into 16 ounces. If sacked or packaged material is furnished, the net weight as packed by the manufacturer may be used.

(g) Mile. 5,280 feet. Measure horizontal along the centerline of each roadway, approach road, or ramp.

(h) Gallon. The quantity may be measured by any of the following methods:

(1) Measured volume container.

(2) Metered volume. Use an approved metering system.

(3) Commercially packaged volumes.

(i) Lump Sum. Do not measure directly. The bid amount is complete payment for all work described in the contract and necessary to complete the work for that item.

(j) Feet. Measure from end to end, parallel to the base or foundation being measured, or horizontal.

(k) Station. 1,000 feet measured horizontally.

(l) Square Yard. Measure on a plane parallel to the surface being measured or horizontal.

Where measurement is horizontal, make no deductions from the area computation for individual exclusions having an area of 1 yd^2 or less.

For pavement structure courses, measure the width horizontally to include the top design width and allowable curve widening. Do not include side slopes. Measure the length horizontally along the centerline of each roadway, approach road, or ramp.

(m) Thousand Board Feet. 1,000 board feet based on nominal widths, thickness, and extreme usable length of each piece of lumber or timber actually incorporated in the job. For glued laminated timber, 1,000 board feet based on actual width, thickness, and length of each piece actually incorporated in the job.

(n) Ton. Short ton consisting of 2,000 pounds

No adjustment in contract unit price will be made for variations in quantity due to differences in the specific gravity or moisture content.

Use net certified scale weights, or weights based on certified volumes.

106.04 Methods of Measurement

One of the following methods of measurement for determining final payment is DESIGNATED IN THE SCHEDULE OF ITEMS for each PAY ITEM:

(a) Designed Quantities (DQ). These quantities denote the final number of units to be paid for under the terms of the contract. They are based upon the original design data available prior to advertising the project. Original design data include the preliminary survey information, design assumptions, calculations, drawings, and the presentation in the contract. Changes in the number of units DESIGNATED IN THE SCHEDULE OF ITEMS may be authorized under any of the following conditions:

(1) Changes in the work authorized by the CO.

(2) A determination by the CO that errors exist in the original design that cause a PAY ITEM quantity to change by 15 percent or more.

(3) A written request submitted to the CO showing evidence of errors in the original design that cause the quantity of a PAY ITEM to change by 15 percent or more. The evidence must be verifiable and consist of calculations, drawings, or other data that show how the designed quantity is in error.

(b) Staked Quantities (SQ). These quantities are determined from staked measurements prior to construction.

(c) Actual Quantities (AQ). These quantities are determined from measurements of completed work.

(d) Vehicle Quantities (VQ). These quantities are measured or weighed in hauling vehicles.

(e) Lump Sum Quantities (LSQ). These quantities denote one complete unit of work as required by or described in the contract, including necessary materials, equipment, and labor to complete the job.

106.05 Price Adjustment for Asphalt Materials

106.06 Earthwork Tolerances

Where tolerances are shown in the contract, they are intended to define "reasonably close conformity." Make adjustments of horizontal or vertical alignment within the tolerances specified in this contract, or shifts of balance points up to 100 feet, as necessary to produce the designed roadway section and to balance earthwork. Such adjustments will not be considered "changes."

Section 161—Certification for Quality & Quantity

Description

161.01 Work. Provide certification that the quality and quantity of construction conforms to the drawings, specifications, and requirements of the contract.

Construction

161.02 Certifications & Measurements. Meet the following requirements for offsite-produced materials and quantity measurements:

(a) Offsite-Produced Materials. Furnish certificates executed by the manufacturer, supplier, or vendor, stipulating that all materials produced offsite that are incorporated into the work meet the applicable requirements SHOWN ON THE DRAWINGS or stated in the specifications. Make each certificate apply to a single commodity or invoice. Certify all incidental purchases needed to remedy minor shortages of material.

(b) Quantity Measurements. Make all measurements for computation of quantities for all work items, except those specified for payment by designed quantity or lump sum. Compute the quantities for periodic progress payments; the CO will compute the quantities for the final payment based on measurements taken. All Contractor measurements are subject to verification. Submit all field notes, calculation sheets, and other data used to determine quantities, and certify in writing as to the accuracy of the measurements and computations submitted.

The following format, or one containing the following information, will be acceptable to the Government:

Road No. _____		Contract No. _____		
Pay Item No.	Date	Station	Quantity or Measurement	Measured By (Initials)

161.03 Records. Meet the following requirements for as-built drawings:

As-Built Drawings. Maintain a set of the contract drawings depicting as-built conditions. Maintain these drawings in current condition, and make them available for review. Indicate all variations from contract drawings in red on the drawings. Upon completion of the contract work, submit as-built drawings to the CO.

Measurement

161.04 Method. Make no separate measurements for this item.

Payment

161.05 Basis. Payment will be considered incidental to other pay items in this contract.

Section 201—Clearing & Grubbing

Description

201.01 Work. Clear and grub; treat timber, construction slash, and debris; and preserve vegetation and objects designated to remain free from injury or defacement.

Construction

201.02 Clearing & Grubbing. Clear and grub in accordance with the following:

(a) Exceptions. Within the clearing limits, clear and treat trees, debris, stumps, roots, and other protruding vegetative material not designated to remain, except the following:

(1) Undisturbed stumps outside the roadway or in embankment areas, provided they do not extend more than 12 inches above the original ground (measured from the uphill side); they are no closer than 24 inches to the finished subgrade or 12 inches to any slope surface, or as otherwise SHOWN ON THE DRAWINGS; and they do not interfere with the placement or compaction of embankments.

(2) Material in channel changes, rock sections, and ditches that is below the depth of the proposed excavation.

(3) Uncut vegetation less than 3 feet in height and less than 3 inches in diameter, that is within the clearing limits but beyond the roadway and not in a decking area, and that does not interfere with sight distance along the road.

(b) Performance. Grub all roots over 3 inches in diameter within the roadbed area to a minimum depth of 6 inches below subgrade. Cut flush with the excavated road surface all roots over 3 inches in diameter that protrude from the excavated slope.

Clear slash treatment areas and treat debris in accordance with Subsections 201.02(a) and 201.05.

Clear decking areas and treat debris in accordance with Subsection 201.05.

Unless shown otherwise in the PROJECT SPECIFICATIONS, fell trees into the area being cleared when ground conditions, tree lean, and shape of clearing permit.

Use controlled felling to ensure the direction of fall to prevent damage to property, structures, trees designated to remain, and traffic.

Dead trees over 6 inches in diameter measured 12 inches above the ground that lean toward the road and are sufficiently tall to reach the roadbed are designated for cutting. Fell hazard trees or unstable live trees that are tall enough to reach the roadbed, when marked, before felling timber in the immediate clearing vicinity. Maximum stump height is 12 inches or one-third of the stump diameter, whichever is higher, measured on the side adjacent to the highest ground. Leave trees felled outside the clearing limits in place, and treat them no further unless otherwise SHOWN ON THE DRAWINGS.

Trim branches on remaining trees or shrubs to give a clear height of 14 feet above the roadbed, unless otherwise SHOWN ON THE DRAWINGS. Trim tree limbs as near flush with the trunk as practicable.

201.03 Utilization of Timber. Merchantable timber is timber that meets Utilization Standards in the PROJECT SPECIFICATIONS. Conform logging methods and utilization to the following:

(a) Felling & Bucking. Fell trees to minimize damage to merchantable timber and to remaining trees located outside of clearing limits. Fell trees with saws or shears unless shown otherwise in the PROJECT SPECIFICATIONS. Buck logs to permit removal of all minimum pieces set forth in the PROJECT SPECIFICATIONS.

(b) Utilization & Removal of Timber. Remove or treat trees that equal or exceed the diameters and minimum lengths listed in the PROJECT SPECIFICATIONS, and that contain one minimum piece, using one of the following methods, as DESIGNATED IN THE SCHEDULE OF ITEMS:

(1) Dispose of merchantable timber designated for removal in accordance with the B(BT) provisions of the Timber Sale Contract.

(2) Limb and deck logs that meet Utilization Standards at locations approved by the CO or SHOWN ON THE DRAWINGS. Deck logs such that logs are piled parallel one to the other; can reasonably be removed by standard log-loading equipment; will not damage standing trees; and will not roll. Log decks are to be free of brush and soil.

(3) Remove from Government land merchantable timber designated for removal, without charge to the Government. This timber becomes the property of the Contractor, but may not be exported from the United States or used as substitution (as defined in 23 CFR 223.10) for timber from private lands exported by the Contractor or an affiliate, directly or indirectly.

(4) Dispose of unmerchantable timber in accordance with Subsection 201.05 by the treatment methods SHOWN ON THE DRAWINGS and DESIGNATED IN THE SCHEDULE OF ITEMS.

201.04 Pioneer Roads. During pioneering operations, prevent undercutting of the final excavation slope. Avoid any restriction of drainages while pioneering the road. Keep all materials within the roadway limits unless otherwise SHOWN ON THE DRAWINGS.

201.05 Slash Treatment. Use or treat construction slash larger than 3 inches in diameter and 3 feet in length by one or more of the following methods, as DESIGNATED IN THE SCHEDULE OF ITEMS:

(1) Windrowing construction slash.
(2) Windrowing large material.
(3) Windrowing and covering.
(4) Scattering.
(5) Burying.
(6) Chipping or grinding.
(7) Piling and burning.
(8) Decking unmerchantable material.
(9) Placement in cutting units.
(10) Removal.
(11) Piling.
(12) Placing slash on embankment slopes.
(13) Debris mat.

Pieces of wood less than 3 inches in diameter and 1 m in length may be scattered within the clearing limits.

(a) All Methods. Construction slash placement will not be allowed in lakes, meadows, streams, or streambeds. Immediately remove construction slash that interferes with drainage structures.

Fell and dispose of trees that are scorched or damaged beyond recovery, and adjacent to the clearing limits, in accordance with Subsection 201.03; or treat these trees as construction slash.

(b) Specific Methods. When using one or more of the following slash treatment methods, meet requirements specified below:

(1) Windrowing Construction Slash. Windrow according to the following requirements unless otherwise specified in the PROJECT SPECIFICATIONS. Clear areas to accommodate the windrow slash. Place construction slash outside the roadway in neat, compacted windrows laid approximately parallel to and along the toeline of embankment slopes. Do not permit the top of the windrows to extend above the top of subgrade. Use construction equipment to matt down all material in a windrow to form a compact and uniform pile. Construct breaks of at least 5 m at least every 60 m in a windrow. Do not place windrows against trees. A pioneer road may be constructed to provide an area for placement of windrows, provided the excavated material is kept within the clearing limits and does not adversely affect the road construction.

(2) Windrowing Large Material. Windrow construction slash that is 10 inches or more in diameter at the small end, and 6 feet or more in length, as specified in Subsection 201.05(b)(1). Treat smaller material by one or more of the other included methods for slash treatment.

(3) Windrowing & Covering. Place and compact construction slash as specified in Subsection 201.05(b)(1), and cover with at least 6 inches of rock and soil to form a smooth and uniform windrow.

(4) Scattering. Scatter according to the following requirements unless otherwise specified in the PROJECT SPECIFICATIONS. Scatter construction slash outside the clearing limits without damaging trees. Limb all logs. Place logs and stumps away from trees, positioned so they will not roll, and are not on top of one another. Limb and scatter other construction slash to reduce slash concentrations.

(5) Burying. Bury construction slash at the locations SHOWN ON THE DRAWINGS and designated on the ground. Mat construction slash down in layers, and cover it with at least 24 inches of rock and soil. Smooth and slope the final surface to drain.

(6) Chipping or Grinding. Process construction slash that is up to at least 4 inches in diameter and longer than 1 m through a chipping machine or machine designed and operated to grind slash and stumps into pieces, such as a tub grinder. Deposit chips or ground woody material on embankment slopes or outside the roadway to a loose depth not exceeding 6 inches. Minor amounts of chips or ground woody material may be permitted within the roadway if they are thoroughly mixed with soil and do not form a layer.

(7) Piling & Burning. Deposit construction slash in areas SHOWN ON THE DRAWINGS and designated on the ground. Construct piles so that burning does not damage standing trees. If burning is incomplete, repile and burn the slash remaining until pieces are reduced to less than 3 inches in diameter and 3 feet in length. Scatter the remaining pieces.

(8) Decking Unmerchantable Material. Deck logs that do not meet Utilization Standards specified in Subsection 201.03, and other material that exceeds the diameter and length shown in the PROJECT SPECIFICATIONS in areas SHOWN ON THE DRAWINGS. Other locations may be approved by the CO.

Cut material into lengths not exceeding 32 feet, and remove all limbs. Decks are to be stable and free of brush and soil. Treat other material according to slash treatment methods SHOWN ON THE DRAWINGS and in the SCHEDULE OF ITEMS.

(9) Placement in Cutting Units. Place construction slash from within cutting units and the adjacent 60 m with cutting unit logging slash. Place construction slash at least 50 feet inside the cutting unit boundary such that it will not inhibit logging of the unit and may be treated by the prescribed logging slash treatment method.

(10) Removal. Remove or haul construction slash to locations SHOWN ON THE DRAWINGS or designated on the ground.

(11) Piling. Pile construction slash in areas SHOWN ON THE DRAWINGS or designated on the ground. Place and construct piles so future burning will not damage remaining trees. Keep piles reasonably free of dirt from stumps. Cut unmerchantable logs into lengths of less than 20 feet prior to placement in the pile.

(12) Placing Slash on Embankment Slopes. Place construction slash on completed embankment slopes to reduce soil erosion where SHOWN ON THE DRAWINGS. Place construction slash as flat as practicable on the completed slope. Place slash from the toe of the embankment to a point at least 24 inches below subgrade elevation. Priority for use of available slash is for: (1) through fills; (2) insides of curves; and (3) ditch relief outlets.

(13) Debris Mat. Use tree limbs, tops, cull logs, split stumps, wood chunks, and other debris to form a mat upon which construction equipment is operated. Place stumps upside down and blend stumps into the mat.

Measurement

201.06 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Linear measurements are to be horizontal along the road centerline.

Area quantities are the number of acres within the clearing limits.

Individual removal of trees is the number of trees of the various size designations removed. Measure tree diameters at a height of 12 inches above ground. Do not count trees less than 6 inches in diameter. Size designations are shown in table 201-1.

Table 201-1.—Size designations for trees removed.

Pay Item Designation	Size of Least Diameter at Height of 300	
	Greater Than	Less Than
Small	6 inches	24 inches
Medium	24 inches	36 inches
Large	36 inches	–

Payment

201.07 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

Pay Item	Pay Unit
201 (01)	Clearing and grubbing, slash treatment methods for tops and limbs _____ _____ _____ _____, logs _____ _____ _____, and stumps _____ _____ _____, utilization of timber _____ ..... Acre
201 (02)	Clearing and grubbing, slash treatment methods for tops and limbs _____ _____ _____ _____, logs _____ _____ _____, and stumps _____ _____ _____, utilization of timber _____ ..... Mile
201 (03)	Clearing and grubbing, slash treatment methods for tops and limbs _____ _____ _____ _____, logs _____ _____ _____, and stumps _____ _____ _____, utilization of timber _____ ..... Lump Sum
201 (04)	Individual removal of trees, small; slash treatment methods for tops and limbs _____ _____ _____ _____ and logs _____ _____ _____ _____, utilization of timber _____ ..... Each
201 (05)	Individual removal of trees, medium; slash treatment methods for tops and limbs _____ _____ _____ _____ and logs _____ _____ _____ _____, utilization of timber_____ ..... Each
201 (06)	Individual removal of trees, large; slash treatment methods for tops and limbs _____ _____ _____ _____ and logs _____ _____ _____ _____, utilization of timber _____ ..... Each
201 (07)	Individual removal of trees, miscellaneous; slash treatment methods for tops and limbs _____ _____ _____ _____ and logs _____ _____ _____ _____, utilization of timber _____ ..... Each
201 (08)	Individual removal of trees; slash treatment methods for tops and limbs and logs , utilization of timber _____ ..... Mile
201 (09)	Individual removal of stumps, slash treatment methods _____ ..... Each

Section 202—Removal of Structures & Obstructions

Description

202.01 Work. Salvage, remove, and/or dispose of buildings, fences, structures, pavements, culverts, utilities, curbs, sidewalks, and other obstructions as SHOWN ON THE DRAWINGS. Salvage designated materials and backfill the resulting trenches, holes, pits, or as SHOWN ON THE DRAWINGS.

Construction

202.02 Salvaging Material. 202.03 Removing Material. Culverts removed and not designated for salvage shall become the property of the Contractor and will be removed from National Forest lands.

Remove structures and obstructions in the roadbed to 12 inches below subgrade elevation. Remove structures and obstructions outside the roadbed to 12 inches below finished ground or to the natural stream bottom.

Prior to removal, place rock and soil material located on the bridge deck, or structure so that it does not enter a stream.

Remove the substructures of existing structures down to the natural stream bottom, and remove the parts outside of a stream down to at least 12 inches below natural ground surface or finished ground line, whichever is lower. Remove portions of existing structures that lie wholly or in part within the limits for a new structure to accommodate construction of the proposed structure.

Except in excavation areas, fill cavities left by structure removal with material to the level of the finished ground, and compact. Place and compact the type of backfill material that is SHOWN ON THE DRAWINGS, designated in the PROJECT SPECIFICATIONS, or approved by the CO.

202.04 Disposing of Material or Structures Not Designated for Salvage. Culverts and gates designated for removal shall become the property of the Contractor and will be removed from National Forest lands.

Measurement

202.05 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment

202.06 Basis. The accepted quantities will be paid for at the contract unit price for each PAY

ITEM DESIGNATED IN THE SCHEDULE OF ITEMS. Payment will be made under:

Pay Item	Pay Unit
202(02) Removal of Existing CMP…..……	Each
202(03) Removal of Earth Berm …….……..	Each

Section 203—Excavation, Embankment, & Haul

Description

203.01 Work. Excavate material and construct embankments. Furnish, haul, stockpile, place, dispose of, slope, shape, compact, and/or finish earthen and rocky material.

203.02 Excavation. Excavation consists of the excavation and placement of all excavated material that is not included under other PAY ITEMS listed in the SCHEDULE OF ITEMS.

203.03 Borrow Excavation. Excavate and utilize material from sources SHOWN ON THE DRAWINGS or described in the PROJECT SPECIFICATIONS. Additional sources of borrow excavation will be subject to advance approval by the CO. Develop sources in accordance with Section 611.

Construction

203.04 Clearing & Grubbing. Clear and grub in accordance with Section 201 before work under Section 203 begins. Road pioneering, slash disposal, and grubbing of stumps may proceed concurrently with excavation when approved by the CO. Conduct excavation and placement operations so material to be treated under Section 201 will not be incorporated in the roadway unless specifically included in the slash treatment method.

203.05 Pioneering. During pioneering operations, prevent undercutting of the final excavation slope. Avoid any restriction of drainages while pioneering the road. Keep all materials within the roadway limits unless otherwise SHOWN ON THE DRAWINGS.

203.06 Utilization of Excavated Materials. Use all suitable excavated material in the construction of embankments, subgrades, shoulders, slopes, bedding, and backfill for structures and other purposes, as SHOWN ON THE DRAWINGS.

(a) Excess Excavation. Place excess excavation on adjacent fill slopes or AS DIRECTED BY THE ENGINEER.

(b) Rock for Slope Protection. Conserve and use suitable excavated rock for protecting embankments.

(c) Conserving Material. Excavated material suitable for cushion, road finishing, or other purposes may be conserved and utilized instead of materials from designated sources. Field drain and dry excessively wet material that is otherwise suitable for embankment before placement.

(d) Excavation of Unsuitable Material & Backfill. Place unsuitable excavated material as SHOWN ON THE DRAWINGS. Backfill excavated areas with suitable material when necessary to complete the work. Do not place frozen material in embankments.

Break up rocks that are too large to be incorporated into the embankment or move them to locations approved by the CO. Broken pieces of rock may be placed on the face of the embankment and embedded so they will not roll or obstruct the use and maintenance of the roadbed. Immediately remove any excavated material that inadvertently reaches a stream course.

(e) Conservation of Topsoil. When SHOWN ON THE DRAWINGS, remove, transport, and deposit suitable topsoil in the designated stockpile areas.

(f) Abandoned Structures & Obstructions. Treat abandoned structures and obstructions in accordance with Section 202.

203.07 Drainage Excavation. Construct catch basins, drain dips, water bars and sags, side ditches, minor channel changes, inlet and outlet ditches, furrow ditches, ditches along the road but beyond roadway limits, and other minor earth drainage structures as SHOWN ON THE DRAWINGS. Utilize excavated material in accordance with Subsection 203.06.

203.08 Sloping, Shaping, & Finishing. Complete slopes and ditches before placing aggregate courses. Slope, shape, and finish as follows:

(a) Sloping. Leave all earth slopes with uniform roughened surfaces, except as described in Subsection 203.08(b), with no noticeable break as viewed from the road. Except in solid rock, round the tops and bottoms of all slopes, including the slopes of drainage ditches, where SHOWN ON THE DRAWINGS. Round the material overlaying solid rock to the extent practical.

If a slide or slipout occurs on a cut or embankment slope, remove or replace the material, and repair or restore all damage to the work. Bench or key slope to stabilize the slide. Reshape the cut or embankment slope to an acceptable condition.

(b) Stepped Slopes. Where SHOWN ON THE DRAWINGS, construct steps on slopes of 1.3:1 to 1:2. Construct the steps about 20 inches high. Blend the steps into natural ground at the end of the cut. If the slope contains nonrippable rock outcrops, blend steps into the rock. Remove loose material found in transitional area. Except for removing large rocks that may fall, scaling stepped slopes is not required.

(c) Shaping. Shape the subgrade to a smooth surface and to the cross section required. Shape slopes to gradually transition into slope adjustments without noticeable breaks. At the ends of cuts and at intersections of cuts and embankments, adjust slopes in the horizontal and vertical planes to blend into each other or into the natural ground. For roads receiving base or surface course, rocks may remain in place if they do not protrude above the subgrade more than one-third of the depth of the base or surface course, or 3 inches, whichever is less.

(d) Finishing. Finish the road surface to be reasonably smooth, uniform, and shaped to conform to the typical sections as SHOWN ON THE DRAWINGS. Remove unsuitable material from the roadbed and replace it with suitable material. Finish roadbeds to the tolerance class shown in table 203-1 or as SHOWN ON THE DRAWINGS.

Ensure that the subgrade for both surfaced and unsurfaced roads is visibly moist during shaping and dressing. Bring low sections, holes, cracks, or depressions to grade with suitable material. Compact the subgrade as required by the designated embankment placing method.

Finish the roadbed for unsurfaced roads using one of the following methods, as SHOWN ON THE DRAWINGS:

(1) Method A. Ensure that the top 4 inches below the finished roadbed contains rocks no larger than 4 inches. Remove oversize material, reduce to acceptable size, or cover by importing suitable material approved by the CO.

(2) Method B. Roll the roadbed to break down rocky material. Roll a minimum of five full-width passes, or until visual displacement ceases, with a vibratory grid roller or equivalent weighing a minimum of 9 t.

(3) Method C. Tractor finish work by spreading the excavation for roads SHOWN ON THE DRAWINGS as Construction Tolerance Class K, L, or M, as shown in table 203-1. Eliminate rock berms that may form during embankment construction with a tractor finish.

Table 203-1 - - Construction Tolerances

	Tolerance Class[a]												
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
Roadbed width (inches)	6	6	12	12	12	12	12	18	12	24	24	24	24
Subgrade elevation (inches)	±1.5	±3	±3	±6	±6	±12	±12	±18	±24	±36	±24	±36	-[c]
Centerline alignment (inches)	2.5	2.5	6	6	12	12	12	18	24	36	36	60	-[c]
Slopes, excavation, and embankment (%slope)[b]	±3	±5	±5	±5	±5	±5	±10	±10	±10	±10	±20	±20	±20

[a]. Maximum allowable deviation from construction stakes and drawings.

[b]. Maximum allowable deviation from staked slope measured from slope stakes or hinge points.

[c]. Unless otherwise SHOWN ON THE DRAWINGS, the centerline alignment and subgrade elevation, as built, have no horizontal curves with a radius of less than 26 m, and no vertical curves with a curve length of less than 25 m when the algebraic difference in the grade change is less than 10 percent, or a curve length of less than 30 m when the algebraic difference of the grade change is greater than or equal to 10 percent. The centerline grade is not to exceed 20 percent in 30 m of length.

203.09 Snow Removal. Remove snow and ice in advance of the work and deposit beyond the roadway limits in a manner that will not waste material. Snow and ice will not be incorporated into the embankment or be placed to cause damage.

203.10 Finishing Slopes. Ensure that finished slopes conform reasonably to the lines STAKED ON THE GROUND or SHOWN ON THE DRAWINGS. Finish slopes in a roughened condition to facilitate the establishment of vegetative growth. The finish associated with template and stringline or hand-raking methods will not be required. Remove rock, debris, and other loose material that are more than 6 inches in diameter, unless otherwise SHOWN ON THE DRAWINGS.

203.11 Landscape & Stream Protection. Confine excavation, blasted material, and embankment material within the roadway limits, unless otherwise approved by the CO, to avoid overbuilding and to protect the landscape and streams. Retrieve and incorporate into designated areas all material deposited outside of the clearing limits.

203.12 Subgrade Treatments.

203.13 Earth Berms. Construct earth berms as SHOWN ON THE DRAWINGS**.**

203.14 Water.

203.15 Compaction Equipment. Use equipment capable of obtaining compaction requirements. The compacting units may be of any type, provided that they are capable of compacting each lift of material as specified, and that they meet the minimum requirements specified below. Heavier compacting units may be required to achieve the specified density of the embankment. Minimum requirements for rollers are as follows:

(a) Sheepsfoot, tamping, or grid rollers shall be capable of exerting a force of 250 pounds per inch of width of roller drum.

(b) Steel-wheel rollers, other than the vibratory type, shall be capable of exerting a force of not less than 250 pounds per inch of width of the compression roll or rolls.

(c) Vibratory steel-wheel rollers shall have a minimum weight of 6 tons. The compactor shall be equipped with amplitude and frequency controls, and specifically designed to compact the material on which it is used.

(d) Pneumatic-tire rollers shall have smooth tread tires of equal size that will provide a uniform compacting pressure for the full width of the roller and capable of exerting a ground pressure of at least 80 pounds per square inch.

203.16 Embankment Placement. Place embankment in accordance with the following requirements:

(a) All Methods. Construct the lower part of the embankment in a single layer to the minimum depth necessary to support construction equipment when an embankment is to be placed across swampy ground and removal of unsuitable material or subgrade treatment is not required.

(b) Specific Methods. Place all embankments using one or more of the following methods, as SHOWN ON THE DRAWINGS and listed in the SCHEDULE OF ITEMS:

(1) Method 1—Side Casting & End Dumping. Embankment may be placed by side casting and end dumping. Build solid embankments by working smaller rocks and fines in with the larger rocks and fines to fill the voids. Obtain compaction by operating hauling/placement equipment over the full width of the placed layer until visible deformation of the layer ceases.

(2) Method 2—Layer Placement. Roughen or step surfaces steeper than a ratio of 1 vertical to 3 horizontal (1:3) upon which embankment is to be placed, when SHOWN ON THE DRAWINGS, in order to provide permanent bonding of new and old materials.

Layer place embankment, except over rock surfaces. Over rock surfaces, material may be placed by end dumping to the minimum depth needed for operation of spreading equipment. Level and smooth each embankment layer before placement of subsequent layers. Operate hauling and spreading equipment uniformly over the full width of each layer.

Place suitable material in layers no more than 12 inches thick, except when the material contains rock more than 9 inches in diameter, in which case layers may be of sufficient thickness to accommodate the material involved. Ensure that no layer exceeds 24 inches before compaction.

Placing individual rocks or boulders greater than 24 inches in diameter will be permitted, provided that the embankment will accommodate them and that they are at least 6 inches below the subgrade. Carefully distribute rocks and fill the voids with finer material to form a dense and compacted mass.

Where material containing large amounts of rock is used to construct embankments, make layers of sufficient thickness to accommodate the material involved. Construct a solid embankment with adequate compaction by working smaller rock and fines in with the larger rocks to fill the voids, and by operating hauling and spreading equipment uniformly over the full width of each layer as the embankment is constructed.

Ensure that material is at a moisture content suitable to obtain a mass that will not visibly deflect under the load of the hauling and spreading equipment. Handle excessively wet material in accordance with Subsection 203.06(c).

(3) Method 3—Layer Placement (Roller Compaction). Place embankments as specified in method 2. Place in horizontal layers not exceeding 12 inches prior to compaction, except when the material contains rock more than 9 inches in diameter, in which case layers may be of sufficient thickness to accommodate the material involved. Obtain compaction using equipment listed in Subsection 203.15. Operate compaction equipment over the full width of each layer until visible deformation of the layer ceases or, in the case of the sheepsfoot roller, the roller "walks out" of the layer. Make at least three complete passes.

(4) Method 4—Controlled Compaction. Place embankments as specified in method 2; but place earth embankments in horizontal layers not exceeding 12 inches (loose measure), and compact them. Ensure that the moisture content of material is suitable for attaining the required compaction. Compact the embankments and the top 12 inches of excavation sections to at least 95 percent of the maximum density, as determined by AASHTO T 99, method C or D.

Determine the density of the embankment material during the progress of the work, in accordance with AASHTO T 191, T 205, or T 238; and T 217, T 239, or T 255. Correct for coarse particles in accordance with AASHTO T 224.

Density requirements will not apply to portions of rock embankments that cannot be tested in accordance with approved methods. When this condition exists, accomplish compaction by working smaller rocks and fines in with the larger rocks to fill the voids and by operating equipment over the embankment materials.

(5) Method 5—Special Project Controlled Compaction. Place and compact embankments to at least 90 percent of the maximum density determined by AASHTO T 180, method C or D, but obtain compaction of not less than 95 percent of AASHTO T 180, method C or D, for a minimum depth of 12 inches below subgrade for the width of the roadbed in both excavation and embankment sections.

Determine density during the work in accordance with AASHTO T 191, T 205, or T 238; T 217, T 239, or T 255; and T 224.

203.17 Construction Tolerances. Construct to the tolerance class as SHOWN ON THE DRAWINGS and in accordance with table 203-1. Construct roadway ditches to flow in the direction SHOWN ON THE DRAWINGS.

Ensure that deviations are uniform in the direction of change for a distance of 200 feet or more along the project centerline.

203.18 Haul. Haul is incidental to excavation and borrow excavation, unless listed as a separate PAY ITEM in the SCHEDULE OF ITEMS.

Measurement

203.19 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Quantities of excavation will include:

(a) Roadway excavation.

(b) Rock and unsuitable material below the required grade, and unsuitable material beneath embankment areas.

(c) Furrow ditches outside the roadway, except when furrow ditches are included in the SCHEDULE OF ITEMS.

(d) Topsoil and other material removed and stockpiled as directed.

(e) Borrow material used in the work, except when borrow is included in the SCHEDULE OF ITEMS.

(f) The volume of conserved materials taken from stockpiles and used in the work, except topsoil included under other PAY ITEMS.

(g) Slide material not attributable to negligence of the Contractor.

Quantities of excavation will not include:

(a) Material used for other than approved purposes.

(b) Unauthorized excavation or borrow.

(c) Quantity of material excavated from slope rounding or slope tapering.

(d) Overbreakage from the backslope in rock excavation requiring blasting.

(e) Material scarified in place to receive the first layer of embankment.

(f) Benching or stepping existing ground for embankment foundation.

(g) Stepping or scaling cut slopes.

(h) Oversize material removed when finishing unsurfaced roads.

When designed quantities are DESIGNATED IN THE SCHEDULE OF ITEMS as the method of measurement, estimate the quantities from design data based on undisturbed ground surface elevations.

When staked quantities are DESIGNATED IN THE SCHEDULE OF ITEMS as the method of measurement, determine excavation quantities by the average end area method using slope stake information taken prior to construction.

When actual quantities are DESIGNATED IN THE SCHEDULE OF ITEMS as the method of measurement, take preliminary cross sections, or comparable measurements, of the undisturbed ground surface; and measure final quantities in accordance with the following:

(a) When excavation is designated as a PAY ITEM in the SCHEDULE OF ITEMS, take final cross sections, or comparable measurements, of the completed and accepted work.

(b) When embankment is designated as a PAY ITEM in the SCHEDULE OF ITEMS, determine measurement in the final position.

(c) When borrow excavation is designated as a PAY ITEM in the SCHEDULE OF ITEMS, determine measurement in the original position.

Payment

203.20 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS. Payment will be made under:

Pay Item		Pay Unit
203(01)	Excavation, Placement Method 1 ……..	Cubic Yard
203(17)CB	Reconstruct Catch Basin …….	Each
203(17)DD	Construct or Reconstruct Drain Dip ……	Each

Section 204—Soil Erosion & Water Pollution Control

Description

204.01 Work. Furnish, construct, and maintain permanent and temporary erosion and sediment control measures.

Materials

204.02 Requirements. Ensure that all other materials are as SHOWN ON THE DRAWINGS or specified in the PROJECT SPECIFICATIONS.

Construction

204.03 Performance. Incorporate all permanent erosion control features into the project at the earliest practicable time to minimize the need for temporary erosion control.

204.04 Construction. Construct erosion control and sediment control measures SHOWN ON THE DRAWINGS as follows:

(a) Construct temporary erosion controls in incremental stages as construction proceeds.

(b) Construct temporary slope drains, diversion channels, and earth berms to protect disturbed areas and slopes.

(c) Apply permanent turf establishment to the finished slopes and ditches within 30 days, or as required in the PROJECT SPECIFICATION or SHOWN ON THE DRAWINGS.

(d) Apply temporary turf establishment on disturbed areas that will remain exposed for more than 30 days.

(e) Construct outlet protection as soon as culverts or other structures are complete.

(f) Construct permanent erosion controls, including waterway linings and slope treatments, as soon as practical or upon completion of the roadbed.

(g) Construct and maintain erosion controls on and around soil stockpiles to prevent soil loss.

(h) Following each day's grading operations, shape earthwork to minimize and control erosion from storm runoff.

204.05 Filter Barriers

204.06 Sediment Retention Structures. Construct sediment retention structures of the following types when SHOWN ON THE DRAWINGS:

(a) Temporary Sediment Traps. Construct temporary sediment traps to detain runoff from disturbed areas and settle out sediment. Provide outlet protection.

(b) Sediment Basins. Construct sediment basins to store runoff and settle out sediment for large drainage areas. Construct sediment basins according to Section 203. Provide outlet protection.

204.07 Outlet Protection. Construct riprap aprons or basins to reduce water velocity and prevent scour at the outlet of permanent and temporary erosion control measures. Construct riprap according to Section 251.

204.08 Water Crossings.

204.09 Diversions.

204.10 Waterway & Slope Protection & Stabilization.

204.11 Temporary Turf Establishment.

204.12 Inspection & Reporting

204.13 Maintenance & Cleanup.

Measurement

204.14 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS. **Payment**

204.15 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS. Payment will be made under:

Pay Item	Pay Unit
204(09) Sediment Basin ……..…….……..	Each

Section 206A—Structural Excavation for Minor Structures

Description

206A.01 Work. Excavate, backfill, and dispose of material for the construction of culverts and minor structures. Preserve channels; shore and brace; seal foundations; dewater; excavate; prepare foundations; bed; and backfill.

Materials

206A.02 Requirements. Ensure that material conforms to specifications in the following sections and subsections:

(a) Foundation Fill
Furnish granular material free of excess moisture, frozen lumps, roots, sod, and other deleterious material and conforming to the following:

(a) Material passing 2 inch sieve 100%
(b) Soil classification, AASHTO M 145 ..... A-1-a
(c) In wet environments, material passing 200 sieve ... 6% max.

(b) Bedding
Furnish approved sand or fine granular material free of excess moisture, muck, frozen lumps, roots, sod, and other deleterious material. Remove all rock particles and hard earth clods larger than 1.5 inches.

(c) Backfill Material
Furnish granular material or fine compatible soil free of excess moisture, muck, frozen lumps, roots, sod, and other deleterious material. Remove all rock particles and hard earth clods larger than 3 inches in the longest dimension.

Construction

206A.03 Preparation for Structural Excavation. Clear the area of vegetation and obstructions according to Sections 201 and 202.

206A.04 General. Excavate trenches or foundation pits according to the following:

(a) Minor Structures. Clean all loose material from all rock or other foundation material and cut to a firm surface that is level, stepped, or serrated. Remove all loose and disintegrated rock and thin strata. When the footing is to rest on material other than rock, complete the excavation just before the footing is to be placed.

(b) Culverts. Construct the width of trenches in natural ground to permit satisfactory joining of the culvert sections and thorough tamping of the bedding material under and around the culvert. Excavate trenches to a minimum width equal to the culvert diameter plus 24 inches.

Construct trenches for culverts being placed in embankments to a width of one diameter, plus one diameter on each side.

Excavate unsuitable foundation material below the invert of the culvert to an approximate depth of 24 inches and a width of at least the culvert diameter plus 4 feet. Remove rock, hardpan, or other unyielding material below the foundation grade for a depth of at least 12 inches and a width of at least 24 inches greater than the outside width of the culvert.

Excavate to foundation grade without unduly disturbing the trench or foundation surface. Foundation grade is the elevation at the bottom of any bedding for the installation of the structure.

206A.05 Channel Preservation.

206A.06 Foundation Seal.

206A.07 Dewatering.

206A.08 Foundation Preparation. Excavate any unsuitable material present at foundation grade, and replace it with foundation fill.

206A.09 Utilization of Excavated Materials. Utilize all suitable excavated material as backfill or embankment. Do not place excavated material in live streams.

Dispose of all surplus material as SHOWN ON THE DRAWINGS or DIRECTED BY THE ENGINEER. Do not deposit excavated material in a manner that will endanger the partly finished structure.

206A.10 Backfill & Embankments for Minor Structures. Backfill excavated areas around minor structures to the level of the original ground surface. Backfill with selected material placed in horizontal layers not over 6 inches (loose measure) in depth. Use compactible material free of frozen lumps, chunks of highly plastic clay, or other objectionable material. Do not use rocks larger than 3 inches in diameter within 12 inches of the structure. Compact each layer in accordance with Subsection 203.16(b), method 3, using a mechanical tamper.

206A.11 Bedding, Backfill, & Embankment for Pipe Culverts. Install bedding, backfill, and embankment for pipe culverts in accordance with Sections 603, 603A, and 603B, unless otherwise SHOWN ON THE DRAWINGS or described in the PROJECT SPECIFICATIONS.

Measurement

206A.12 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Measure bedding material by the cubic meter in place. Measure foundation fill under Section 206.

Payment

206A.13 Basis. Payment will be considered incidental to other pay items in this contract.

Section 210—Brushing / Clearing & Grubbing

Description

210.01 Work. This work consists of removing all vegetative material including limbs, residual slash, live roadside brush, and small trees within the Brushing / Clearing Limits SHOWN ON THE DRAWINGS.

Construction

210.02 Brushing / Clearing Limits. Cut and grub all brush, trees and stumps located on the roadbed and SHOWN ON THE DRAWINGS within the Reconditioning Limits. Care shall be taken to conserve roadbed material when grubbing the roadbed.

Cut all brush and small trees (6 inches diameter, or less, at the point of cut) outside the roadbed and the Reconditioning Limits SHOWN ON THE DRAWINGS, but still inside the Brushing / Clearing Limits, no higher than 4 inches above ground level (6 inches for machine brushing). If rocks or other obstructions are encountered, cut no higher than 6 inches above the obstruction. Limb live trees with a diameter larger than 6 inches to a clear height of 10 feet above the road surface.

210.03 Windfalls. Limb windfalls lying within or across the brushing limits, cut off at the top of the existing cut slope or 5 feet from the shoulder on the fill slope. Dispose of windfall material as slash.

210.04 Road Junctions. Do not deposit brushing debris on the roadway of adjoining roads.

210.05 Slash Treatment. On road sections where brush is light enough, slash may be scattered outside the Brushing / Clearing Limits without damaging residual trees.

On road sections with heavier brush, pile slash outside the Brushing / Clearing Limits at locations agreed to by the Engineer. Construct clean piles so future burning will not damage residual trees. Slash is defined as any material that has a length greater than 36 inches or a diameter greater than 3 inches at any point. Do not deposit material in streams, streambeds, culvert inlets or outlets, drainage ways, or cattle guards.

Measurement

210.06 Method. Measure the Pay Items according to Subsection 106.02 and the following.

Linear measurements will be horizontal along the road centerline.

Quantities will be the number of miles (or stations) and fractions thereof along the road centerline.

Payment

210.07 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

Pay Item		Pay Unit
210(01)	Brushing / Clearing & Grubbing	Mile

Section 251—Riprap

Description

251.01 Work. Furnish and place riprap/drain rock for bank protection, slope protection, drainage structures, and erosion control.

Materials

251.02 Requirements. Riprap/drain rock materials shall be obtained from sources SHOWN ON THE DRAWINGS and DESIGNATED BY THE ENGINEER.

Riprap classes are designated as shown in table 705-1.

Construction

251.03 General. Minimize ground disturbance where practicable in preparing for placement of riprap. Prepare surfaces by removing logs, cutting brush and stumps flush with the ground, or as SHOWN ON THE DRAWINGS. Remove all soft or spongy material to the depths SHOWN ON THE DRAWINGS and replace it with approved material. Perform structural excavation and backfill as specified in Section 206A. Control gradation by visual inspection.

251.04 Placed Riprap. Placed riprap is rock placed on a prepared surface to form a well-graded mass. Place riprap to its full thickness in one operation to avoid displacing the underlying material. Do not place riprap material by methods that cause segregation or damage to the prepared surface. Place or rearrange individual rocks by mechanical or manual methods to obtain a compact uniform blanket with a reasonably smooth surface.

251.05 Keyed Riprap. Keyed riprap is rock placed on a prepared surface and keyed into place by striking with a flat-faced weight.

Place rock for keyed riprap according to Subsection 251.04. Key the riprap into place by striking the surface with the flat-face of the excavator bucket. Do not strike riprap below the water surface.

251.06 Mortared Riprap.

251.07 Sacked Concrete Riprap.

251.08 Sacked Soil Cement Riprap.

251.09 Hand-Placed Riprap.

251.10 Granular Filter Blanket.

251.11 Geotextile.

Measurement

251.12 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment

251.13 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

Pay Item		Pay Unit
251(01)	Placed Riprap, Class 2	Cubic Yard

Section 304—Aggregate Base or Surface Course

Description

304.01 Work. Furnish, haul, and place aggregate base or surface course on the subgrade or base or stockpile site approved by the CO.

Materials

304.02 Source. Obtain materials from sources or stockpiles SHOWN ON THE DRAWINGS, or from other approved sources.

304.03 Gradation. Ensure that grading requirements for Contractor-furnished materials meet the requirements specified in Subsection 703.06.

304.04 Quality.
304.05 Additives.
304.06 Water.
304.07 Mineral Filler.

Construction

304.08 Preparation of Roadbed. Complete the roadbed in accordance with Section 203, 306, or 309, and have it approved in writing by the CO before placing base or surface course.

304.09 Mixing & Placing. Spread the aggregate in a uniform layer, with no segregation of size, and to a loose depth that has the required thickness when compacted.

304.10 Compaction. Compact the aggregate using one of the following methods, as specified in the SCHEDULE OF ITEMS:

(a) Compaction A. Compact the aggregate by operating spreading and hauling equipment over the full width of each layer of the aggregate.

.

(b) Compaction B. Moisten or dry the aggregate to a uniform moisture content suitable for compaction. Operate rollers that meet the requirements specified in Subsection 203.15(b), (c), or (d) over the full width of each layer until visual displacement ceases, making no fewer than three complete passes.

(c) Compaction C. Compact each layer of aggregate to a density of at least 95 percent of the maximum density, as determined by AASHTO T 99, method C or D.

(d) Compaction D. Compact each layer of aggregate to a density of at least 95 percent of the maximum density, as determined by AASHTO T 180, method C or D.

(e) Compaction E. Ensure that materials produced by pit-run and grid-rolling are visually moist and compacted using operating compaction equipment defined in Subsection 203.15(b), (c), and (d) over the full width of each layer until visual displacement ceases.

For all compaction methods, blade the surface of each layer during the compaction operations to remove irregularities and produce a smooth, even surface. When a density requirement is specified, determine the density of each layer in accordance with AASHTO T 191, T 205, T 238, T 217, T 239, T 255, or T 224.

304.11 Stockpiling.

304.12 Thickness & Width Requirements. Ensure that the thickness and width of the compacted aggregate conform to the dimensions SHOWN ON THE DRAWINGS, and that measurements on the compacted aggregate meet the following criteria:
(a) The maximum variation from the specified thickness is 1 inch.
(b) The compacted thickness is not consistently above or below the specified thickness, and the average thickness of 4 or more measurements for any 0.5 miles of road segment is within ± 0.5 inch of the specified thickness.
(c) The compacted width has a (+) 1 foot tolerance.

Measurement

304.13 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment

304.14 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS. Payment will be made under:

Pay Item		Pay Unit
304 (13)	Placing Aggregate, Compaction A, (Gov't. Furnished) ……..…….……	Cubic Yard

Section 306—Reconditioning Existing Road

Description

306.01 Work. Recondition existing road; clean ditches, cattleguards, and culverts, including inlets and outlets; remove slide material; scarify where SHOWN ON THE DRAWINGS; and shape and compact the traveled way and shoulders, including parking areas, turnouts, and approach road intersections.

Construction

306.02 Blading & Shaping. Unless otherwise SHOWN ON THE DRAWINGS, blade and shape the existing traveled way and shoulders, including turnouts, to remove minor surface irregularities. Maintain the existing cross slope or crown, unless otherwise SHOWN ON THE DRAWINGS. Establish a blading pattern that will retain the surfacing on the roadbed and provide a thorough mixing of the materials within the completed surface width.

Scarify and shape the existing traveled way and shoulders at locations and to the depth and width SHOWN ON THE DRAWINGS. Remove any rock larger than 4 inches in its greatest dimension that is brought to the surface during scarification, except as provided below.

306.03 Rock Reduction.

306.04 Drainage. Grade the ditches to the typical sections and at the locations SHOWN ON THE DRAWINGS. Clean catch basins and culverts to drain.

Remove excess materials from the roadbed, culverts, and ditches, and place material as SHOWN ON THE DRAWINGS.

306.05 Cattleguards.

306.06 Compaction. Shape and compact the traveled way and shoulders using one of the methods described below and DESIGNATED IN THE SCHEDULE OF ITEMS.

(a) Compaction A. Compact the aggregate by operating spreading and hauling equipment over the full width of each layer of the aggregate.

(b) Compaction B. Moisten or dry the aggregate to a uniform moisture content suitable for compaction. Operate rollers that meet the requirements specified in Subsection 203.15(b), (c), or (d) over the full width of each layer until visual displacement ceases, making no fewer than three complete passes.

(c) Compaction C. Compact each layer of aggregate to a density of at least 95 percent of the maximum density, as determined by AASHTO T 99, method C or D.

(1) Compaction C-1. Compact each layer of aggregate to a density of at least 96 percent of the maximum density, as determined by the Modified Marshall Hammer Compaction Method (available upon request from USDA Forest Service, Regional Materials Engineering Center, P.O. Box 7669, Missoula, MT 59807).

(d) Compaction D. Compact each layer of aggregate to a density of at least 95 percent of the maximum density, as determined by AASHTO T 180, method C or D.

(1) Compaction D-1. Compact each layer of aggregate to a density of at least 100 percent of the maximum density as determined by the Modified Marshall Hammer Compaction Method (available upon request from USDA Forest Service, Regional Materials Engineering Center, P.O. Box 7669, Missoula, MT 59807).

(e) Compaction E. Ensure that materials produced by pit-run and grid-rolling are visually moist and compacted using operating compaction equipment defined in Subsection 203.15(b), (c), and (d) over the full width of each layer until visual displacement ceases.

For all compaction methods, blade the surface of each layer during the compaction operations to remove irregularities and produce a smooth, even surface. When a density requirement is specified, determine the density of each layer in accordance with AASHTO T 191, T 205, T 238, T 217, T 239, T 255, or T 224.

Measurement

306.07 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment

306.08 Basis. The accepted quantities will be paid for at the contract unit price for each PAY

ITEM DESIGNATED IN THE SCHEDULE OF ITEMS. Payment will be made under:

Pay Item	Pay Unit
306(01) Reconditioning of Roadbed, Compaction A, ……	Mile

Section 601—Mobilization

Description

601.01 Work. Move personnel, equipment, material, and incidentals to the project, and perform all activities necessary to accomplish work at the project site. Obtain permits, insurance, and bonds. This work also includes washing all "earth-moving" construction equipment prior to entering the project area (this does not include personal vehicles, dump trucks, service trucks, material delivery trucks, lowboys, or trailers). Before moving the equipment into the project area, it shall be inspected and approved by a Forest Service designated representative.

Measurement

601.02 Method. Measure mobilization by the lump sum.

Payment

601.03 Basis. The accepted quantity, measured as provided above, will be paid at the contract price per unit of measurement for the PAY ITEM listed below that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Pay Item		Pay Unit
601 (01)	Mobilization	...Lump Sum

Section 603—Metal Pipe

Description

603.01 Work. Furnish and install, or install only, metal pipe and pipe appurtenances, including all bedding and backfilling required to complete the work. The term "metal" refers to aluminum and steel.

Materials

603.02 Requirements. Furnish materials that meet the requirements specified in the following subsections:

Metallic-Coated Corrugated Steel Pipe 707.02
Metallic-Coated Spiral Rib Pipe 707.11

Furnish bedding material that meets the requirements specified in Subsection 603.04.

Furnish backfill materials that meet the requirements specified in Subsection 603.08.

Clean and paint damaged spelter coating caused by welding, field cutting, or mishandling, as specified in Subsection 707.15.

To prevent electrolysis or physical failure, use materials in each pipe installation that are compatible with each other.

Either annular or helical pipe corrugations will be acceptable. Helical corrugated pipe containing annular rerolled ends may be used in conjunction with annular pipe of like or compatible materials.

Provide fabricator's certification that the sheet and pipe fabrication are in accordance with AASHTO M 36, M 196, and M 245, as applicable. Submit the certification before installing the pipe.

The lengths and locations of individual pipe SHOWN ON THE DRAWINGS are approximate. Do not order pipe until culvert locations are DESIGNATED ON THE GROUND.

Construction

603.03 Excavation. Excavate in accordance with the requirements specified in Section 206A.

Specific pipe installation time restrictions and installation plan requirements are SHOWN ON THE DRAWINGS.

603.04 Bedding. Bed the pipe to a depth of not less than 10 percent of its total height. After excavating in accordance with Subsection 206A.04(b), compact the foundation surface in accordance with Subsection 603.08 and shape it to fit the pipe.

As bedding material, provide selected mineral soil that meets the requirements for backfill specified in Subsection 603.08. Ensure that completed bedding has a longitudinal, vertical camber approximating 2% of the culvert length.

603.05 Laying Pipe. Lay the lower segment of the pipe so that it is in contact with the bedding for the required depth throughout its length. Place outside circumferential laps facing upstream.

Ensure that the final installed alignment allows no reverse grades, and does not permit any point to vary from a straight line drawn from inlet to outlet by more than 2 percent horizontally and vertically of the culvert length, or 12 inches, whichever is less.

Do not place any pipe in service until a suitable outlet is provided.

Install helically corrugated lock-seam pipe with the seam at the inlet end placed below the horizontal centerline. This requirement applies to the outlet end when the outlet is less than 60 inches below subgrade.

Position longitudinal laps on riveted or spot-welded pipe at any location between 45° above or below horizontal.

603.06 Joining Pipes. Firmly join pipe using form-fitting coupling bands. Attach end sections to the pipe using connecting bands or other means, as recommended by the manufacturer. Install gaskets at each joint to form a watertight connection when SHOWN ON THE DRAWINGS. Do not use dimpled bands when the slope of the pipe is greater than 15 percent.

Ensure that coupling bands meet the strength requirements of field joints for Nonerodible Soil Condition—Special Joint Type, according to division II, section 26, of the "Standard Specifications for Highway Bridges" by AASHTO.

When aluminum alloys come in contact with other metals, coat the contacting surfaces with an asphalt mastic or other impregnated caulking compound approved by the CO.

603.07 Shop Elongation.

603.08 Backfilling. Do not place or backfill pipe that meets any of the following conditions until the excavation and foundation have been approved by the ENGINEER:

- Embankment height greater than 10 feet at subgrade centerline.
- Installation in a live stream.
- Round pipe with a diameter of 48 inches or greater.
- Pipe arches with a span of 50 inches or greater.

After the bedding is prepared and the pipe is placed, place selected material in layers not exceeding 6 inches loose thickness, and compact the material under the haunches and alongside the pipe using a mechanical tamper. Use material that is readily compactible and free of frozen lumps, chunks of highly plastic clay (with a plasticity index greater than 10), or other objectionable material. Do not use rocks larger than 3 inches in greatest dimension within 12 inches of the pipe. On each side of the pipe, place an area of compacted material at least as wide as the diameter of the pipe. Compact the backfill without damaging or displacing the pipe. Ensure that backfill density exceeds the density of the surrounding embankment.

Continue backfilling and compacting until the backfill is a minimum of 12 inches above the top of the culvert.

After bedding and backfilling the pipe, protect it with an adequate cover of embankment before heavy equipment is permitted to cross during roadway construction.

Replace any pipe that is distorted by more than 5 percent of nominal dimensions, or that is ruptured or broken.

Measurement

603.09 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment

603.10 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will made under:

Pay Item		Pay Unit
603(01)18	18-inch Corrugated Steel Pipe, 0.064-inch thickness	Lineal Feet
603(01)24	24-inch Corrugated Steel Pipe, 0.064-inch thickness …….	Lineal Feet
603(01)36	36-inch Corrugated Steel Pipe, 0.064-inch thickness …….	Lineal Feet

Section 625—Seeding & Mulching

Description

625.01 Work. Prepare seedbeds, and furnish and place required seed, fertilizer, limestone, mulch, net, and blanket material.

Materials

625.02 Requirements. Ensure that materials meet the requirements specified in the following subsections:

Fertilizer 713.03
Mulch 713.05
Seed 713.04

Construction

625.03 Seeding Seasons. The normal season dates for seeding shall be from April 1 to November 30. Seeding materials shall not be applied during windy weather or when the ground is excessively wet or frozen, or when snow depth is greater than 2 inches.

625.04 Soil Preparation. Finish the areas to be seeded, as required by other applicable sections, to the lines and grades SHOWN ON THE DRAWINGS. Restore areas that are damaged by erosion or other causes. Ensure that the surface soil is in a roughened condition favorable for germination and growth.

625.05 Application Methods for Seed, Fertilizer, & Limestone. To control erosion, apply seed to disturbed soil and slopes within 30 days of disturbance. If the slopes have not been finished, apply the seed by the dry method as an interim erosion control measure. Apply fertilizer with the seed when specified in the PROJECT SPECIFICATIONS.

The following methods may be used to place material AS DESIGNATED IN THE SCHEDULE OF ITEMS:

(a) Hydraulic Method.

(b) Dry Method. Use hand-operated devices, mechanical, landscape, or cultipacker seeders, seed drills, fertilizer spreaders, or other approved mechanical seeding equipment to apply the seed or seed and fertilizer.

The kinds of seed to be furnished and the amounts to be applied in terms of pure live seed shall be:

Kind of Seed	**Quantity of Pure Live Seed (Lbs/Acre)**
1. Slender Wheatgrass (elymus trachycaulus)	6.0
2. Mountain Brome (bromus marginatus)	9.0
3. Bluebunch Wheatgrass (pseudoroegneria spicata)	4.0
4. Blue Wild Rye (elymus glaucus)	5.0
Total	24.0

Pounds of seed to be furnished per acre shall be obtained by dividing the pounds of pure live seed required per acre by the product of the percent purity and percent germination.

Example: $\frac{5\,lbs.PPLS}{0.90 \times 0.85}$ = 6.55 lbs commercial seed per acre applied

Where: 5 lbs. PPLS = pounds pure live seed per acre required; Purity = 90%: Germination = 85%

Contractor shall provide to the Forest Service:

1. **Blue tags, or copies of blue tags from each seed lot used in the specified mix. Only certified, blue-tagged seed shall be used. The blue tag represents a field certification and serves as evidence of the genetic purity and varietal identity of the seed contained in the seed lot.**

2. **Labels which indicate the percentage composition of the various species in the seed mix.**

3. **Copies of the Seed Analysis Report from a certified seed analyst for each lot used in the specified seed mix. Analysis report must include at a minimum, content of any noxious weed seeds listed on the current "State of Montana Noxious Weeds List". The Contractor will obtain this report from the seed provider. Only after the Forest Service has verified that the seed does not contain any weed seeds on the current "State of Montana Noxious Weeds List" will the seed be accepted and used.**

Fertilizer shall be applied at a rate of 200 pounds per acre in one application by the dry method and have a chemical analysis as listed below:

Nutrient	Percent
Nitrogen, N	16
Phosphorus, P_2O_5	16
Potassium, K	16

625.06 Application of Mulch. The following methods may be used to apply mulch:

(a) Hydraulic Method.

(b) Dry Method. After completion of seeding and fertilizing apply mulch uniformly at the rate of 2,000 pounds per acre, so that 60% of the seeded area is covered by a thin layer of straw. Coverage shall be measured by visual means.

Mulch material shall be clean, Montana certified weed free, clean straw.

625.07 Installation of Netting & Erosion Control Blankets.

625.08 Care During Construction. Protect and care for seeded areas until the work is finally accepted. Repair all damage to seeded areas caused by construction, without additional compensation.

Measurement

625.09 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Base area computations on surface measurements.

Payment

625.10 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS. Payment will be made under:

Pay Item		Pay Unit
625(01)	Seeding, Dry Method (Without Mulch) ……...……	Lump Sum
625(02)	Seeding, Dry Method (Without Mulch) ……..	Acre

Section 640—Road Closure Devices

Description

640.01 Work. Furnish and install, or install only, road closure devices using fabricated gates and accessories, combination post and rail barriers, concrete barriers, earth mound barriers, and other devices as SHOWN ON THE DRAWINGS.

Materials

640.02 Requirements. Furnish materials to be used in fabricating gates and barriers as SHOWN ON THE DRAWINGS.

Furnish metal beam elements, steel posts, structural steel, and steel pipe that meet the requirements SHOWN ON THE DRAWINGS.

Ensure that all hardware is galvanized in accordance with AASHTO M 232 and meets the requirements of ASTM A 307. Furnish plain or cut washers that are American Standard Washers.

Furnish timber posts, rails, and lumber that meet the requirements of AASHTO M 168. Provide timber of the species and type, and rate of preservative treatment, that are SHOWN ON THE DRAWINGS.

Furnish concrete that meets the requirements of Subsection 602.03, method B or C, as SHOWN ON THE DRAWINGS.

Construct earth mound barriers as SHOWN ON THE DRAWINGS from excavated material adjacent to the barrier location, or from other locations as SHOWN ON THE DRAWINGS.

Construction

640.03 Performance. Place road closure devices at the location SHOWN ON THE DRAWINGS. Construct all devices to the dimensions SHOWN ON THE DRAWINGS.

In assembling gates, perform required welding in accordance with the best modern practice and the applicable requirements of AWS D1.1.
After assembly, clean nongalvanized steel pipe gates and paint them with one coat of zinc-rich primer and two coats of exterior enamel of the type and color SHOWN ON THE DRAWINGS or in the SPECIAL PROJECT SPECIFICATIONS.

Set all posts vertically and embed them to the depth SHOWN ON THE DRAWINGS. Place concrete for embedment against undisturbed earth within an excavation sized to achieve the embedment dimensions. Compact the backfill in 6-inch layers to finished grade.

Furnish and install all signs and/or reflective warning markers accessory to the road closure device, as SHOWN ON THE DRAWINGS.

Measurement

640.04 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment

640.05 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

Pay Item	Pay Unit
640(01) Furnish and Install 12 Ft. Standard Livestock Gate …….……..	Each

Section 705—Rock

705.01 Gabion Rock

705.02 Riprap Rock

Furnish hard, durable, angular rock free of organic and spoil material and resistant to weathering and water action. Do not use rounded rock, boulders, shale, or rock with shale seams. Furnish rock from Government supplied stockpiles.

Gradation shall be:

Table 705-1. - Gradation requirements for riprap

Class	% of Rock by Mass	Mass (pounds)	Approximate Cubic Dimension[b,c] (Inches)
2	20	55-110	8-10
	30	22-55	6-8
	40	2-22	3-6
	10[a]	0-2	0-3

a. Furnish spalls and rock fragments graded to provide a stable compact mass.
b. The volume of a rock with these cubic dimensions will have a mass approximately equal to the specified rock mass.
c. Furnish stone with breadth and thickness at least one-third its length.

705.03 Rock for Masonry Structures

705.04 Rock for Mechanically Placed Embankments

705.05 Rock for Hand-Placed Embankments

705.06 Stone Curbing

Section 707—Metal Pipe

707.01 Ductile Iron Culvert Pipe

707.02 Metallic-Coated Corrugated Steel Pipe

Furnish pipe, special sections (such as elbows, branch connections, and prefabricated flared end sections), and coupling bands that conform to AASHTO M 36M and AASHTO M 218, M 274, or M 289 for the dimensions and thicknesses specified.

Fabricate underdrain pipe from a minimum of 1.32-mm steel sheets. Use any class of perforation specified in AASHTO M 36M.

707.03 Aluminum-Alloy Corrugated Pipe

707.04 Asphalt-Coated Pipe

707.05 Steel Structural-Plate Structures

707.06 Aluminum-Alloy Structural-Plate Structures

707.07 Asphalt-Coated Structural-Plate Structures

707.08 Polymer-Coated Steel Pipe

707.09 Fiber-Bonded Bituminous-Coated Steel Pipe

707.10 Slotted Drain Pipe

707.11 Metallic-Coated Spiral Rib Pipe

Furnish pipe, special sections (such as elbows and branch connections), and coupling bands that conform to AASHTO M 36M, type IR and IIR, and AASHTO M 218, M 274, or M 289 for the dimensions and thicknesses specified.

707.12 Aluminum-Alloy Spiral Rib Pipe

707.13 Concrete-Lined Corrugated Steel Pipe

707.14 Invert-Paved Corrugated Steel Pipe

707.15 Repair of Damaged Coatings

Repair damaged coatings in accordance with AASHTO M 36M and ASTM A 849.

Section 713—Roadside Improvement Material

713.01 Topsoil

713.02 Agricultural Limestone

713.03 Fertilizer

Furnish standard commercial-grade dry formulated fertilizer conforming to the standards of the Association of Official Analytical Chemists International, applicable State and Federal regulations, and required minimum percentages of available nutrients.

Supply the fertilizer in new, clean, sealed, and properly labeled containers with name, weight, and guaranteed analysis of contents clearly marked.

A liquid form of fertilizer containing the minimum percentage of available nutrients may be used.

713.04 Seed

Furnish seed that conforms to FSS JJJ–S–181 for seed testing and quality, and is in conformance with the State Seed Acts. If seed species in the specified seed mix are not listed in FSS JJJ–S–181, furnish certified weed-free seed. Do not use wet, moldy, or otherwise contaminated or damaged seed.

Provide seeds as follows:

(a) Furnish each seed type in a separate standard sealed container. Clearly label each container with the following:

(1) Name and type of seed.
(2) Lot number.
(3) Net weight.
(4) Percent of purity, germination, and hard seed.
(5) Percent of maximum weed seed content.

Inoculate legume seed with approved cultures, in accordance with the manufacturer's instructions.

(b) Furnish a product certification for each kind or type of seed, certifying that the seed was tested by a recognized laboratory within 6 months of the date of delivery. Include the following:

(1) Name and address of testing laboratory.
(2) Date of test.
(3) Seed identification.
(4) Test results showing the percentages of purity, germination, and weed content.
(5) Certified weed-free seed.

713.05 Mulch

(a) Straw. Obtain straw for mulching from oats, wheat, rye, or other grain crops that are free from weeds, mold, and other objectionable material. Furnish straw mulch in an air-dry condition suitable for placing with mulch blower equipment.

(b) Hay. Obtain hay from herbaceous mowing. Ensure that it is free from weeds, mold, and other objectionable material. Furnish hay in an air-dry condition suitable for placing with mulch-blower equipment.

713.06 Plant Material

713.07 Erosion Control Mats, Roving, & Geocell

713.08 Miscellaneous Planting Material

713.09 Sprigs

713.10 Sod

713.11 Pegs for Sod

713.12 Stabilizing Emulsion Tackifiers

713.13 Bales

713.14 Sandbags

713.15 Erosion Control Culvert Pipe

713.16 Silt Fence

If approved, variations from the above may be permitted to accommodate premanufactured fences.